Hot Stamped Steel One-Piece Door Ring in the All-New 2019 Ram 1500

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• All new 2019 RAM 1500 Truck overview
• Steel strategy and content
• Truck performance
  – NVH
  – Safety
• Hot Stamped Door Ring
2019 Ram 1500 Exterior Styling
2019 MY Ram 1500 - No Compromise

**STRENGTH**

- Durability focus
- 98% High Strength Steel Frame
- Splayed Front Frame Rails
- 54% High Strength Steel Cab and Box Structure
- Largest brakes (14.9”)
- 100 + Safety Features

**SAFETY**

- 2,300 lbs. Max Payload
- 12,750 lbs. Max Towing
- Performance – Pentastar® V6 and Hemi® w/ eTorque technology
- Off-Road – Rebel and Off-Road Group
- Chassis – Protection Group, Air Suspension
- Cargo – Rambox®, Bed Divider, Most Interior Storage – 2x competition, Bed Step

**CAPABILITY**

- Largest brakes (14.9”)
- 100 + Safety Features

**TECHNOLOGY**

- 12” Touchscreen Radio
- SiriusXM MyControl 360L
- Blindspot Detection w/ Trailer Coverage
- 19-Speaker, 900W Harman Kardon Sound System
- More than 100 Safety Features including:
  - Forward Collision Mitigation
  - 360 SurroundView Camera
  - Adaptive Cruise Control w/ Stop Go
- Efficiency – eTorque mild hybrid, Active Air Dam, More Aerodynamic, MDS

**LUXURY**

- Superior Ride & Handling
- 5-link coil suspension
- 4-corner air suspension
- +4” Cab length for the most spacious interior
- Reclining Rear Seat
- Power Running Boards
- Genuine Materials - Leather/Wood/Metal
- Quietest Cab
- Ventilated Rear Seats
- Dual Pane Sunroof
- Flat Load Floor
Improved Capability – Payload & Towing

- Max Towing 12,750 lbs 20% increase 256 mm gear set
- Max Payload 2,300 lbs 22% increase

- Front Suspension 20% Increase roll stiffness Frequency Response Damping

- Rebel – 33” GY Duratrac
- 4x4 Off-Road Package
- eLocke
- Exclusive Air Suspension

- LED Quad Projector w/adaptive cornering - 15° outer lens pivot

- Rear Suspension Variable Rate Springs Frequency Response Damping

- 18” Brakes BIC stopping distance
**Efficiency**

- 98% High Strength Steel Frame w/ Double-Shear Welded X-mbrs
- 54% High Strength Steel Body
- Aluminum Hood & Tailgate -225 lbs

0.357 Aero Drag Coefficient
- Active Air Dam
- Active Grille Shutters
- BIW Contour 9% reduction

- eTorque Mild-Hybrid
- Gen 2 8-speed trans

5.7L
- Incr’d Cyl Deactivation
- 850W eFan
- Thermal Axle

3.6L Pentastar® Upgrade
- Cooled EGR
- 2-step valve lift
- Incr’d Compression Ratio 10% improvement

- Tire Rolling Resistance 10% reduction w/o compromise to ride, steering & handling
Weight Savings

- Total vehicle weight savings: 225 lbs
- Chassis weight savings: 125 lbs
  - 98% high strength steel frame
- Body weight savings: 101 lbs
  - Aluminum tailgate savings: 19 lbs
  - Increase high strength steel usage (12% to 54% new Ram)
2019 Ram 1500 Body Structure Improvements

- Improved NVH and Refinement
- 4 X Roof Strength (IIHS)
- IIHS SORB Safety
- +1.5” Box Height
- +4” Cab Length
**Body Stiffness – Cab Normal Modes**

- The higher bending mode of the new Ram 1500 helps to provide improved ride comfort.
- The hydroformed engine box structure improves front end torsion stiffness.
Body Stiffness – Normal Modes

- Minimal deformation of Door Ring structure in Bending mode
- Nodal point at B-Plr
- Continuous distribution of strain energy through joints and working sections
Body Stiffness – Normal Modes

- Clean, global torsion mode
- Deformation modes limited to y-plane in torsion mode
- Continuous distribution of strain energy through joints and working sections
Body Weight Reduction Milestones

<table>
<thead>
<tr>
<th></th>
<th>2016 DS</th>
<th>2019 DT</th>
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<tbody>
<tr>
<td>Cab and Box</td>
<td>906</td>
<td>805</td>
</tr>
<tr>
<td>Aluminum Tailgate</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Steel Closures</td>
<td>19</td>
<td>24</td>
</tr>
</tbody>
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Body Weight [lbs]
Steel-Intensive Design Strategy

- Steel-intensive, lightweight design with high strength structural adhesive
- Strategic mix of hot stamped, UHSS, dual phase and HSLA steels
- Efficient, lightweight body structure, with improved stiffness and strength

**Cab:** weight reduction (-10%)

**Box:** weight reduction (-15%)

**Body Structure:** 101lbs weight reduction (-11%)
Dual phase steel, hydroformed tubes for strong and efficient engine box structure

- Dual phase steel sill structure
- Hot stamped underbody crossmember to efficiently control side impact intrusion
DT Crew Material Summary - Upperbody

- Mild steel used for exterior surface parts requiring high formability and appearance
- Dual phase steel structural reinforcements
- Hot stamped steel door ring structure and front header provide strong, lightweight designs for impact
Mild steel panels for parts with high formability requirements
HSS floor panel
AHSS hydroformed rear
Dual phase steel crossmembers and front panel to maximize durability and lower weight
Bodyside Structure Weight Comparison

‘18 Ram 1500
Multi-piece Door Ring Construction (HSS)
136 lbs/vehicle
32 lbs
36 lbs

‘19 Ram 1500
Hot Stamped Door Ring Structure (AHSS & UHSS)
114.3 lbs/vehicle.
22 lbs
21.7 lbs saved per vehicle
35.2 lbs

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Hot Stamped, Laser-Welded Blank Door Ring

- 6-piece Laser Welded blank
  - 4 gauges
  - 2 material grades
    - Press-quenched grade for lower B-pillar to allow increased elongation and optimize B-pillar mode for side impact
Gestamp Door Ring Overview
Gestamp Door Ring Overview

Cost savings…
- Reduced Complexity OEM assembly line
- Reduced floor space in customer assembly line
- Reduce tooling investment
- Spot weld reduction
- High Stability
- Improved Efficiency

... with weight savings
- Joint continuity
- Dimensional accuracy
Gestamp Mason Production Plan

- 3 specific Press Hardening Door ring lines
- 1 Door ring laser cutting cell with 9 dedicated robots
Door Ring Manufacturing Process

DOOR RING MANUFACTURING PROCESS CHAIN

Blanking  Laser welded blanks  Press hardening process  Robot laser cutting & Final welding assembly

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Key features

- Sized for Door Ring efficiency
- 1600 Ton high speed hydraulic press
- Full process parameter control, monitoring & data storage
- CQI-9 Standard compliance & cloud connected
- Automatic racking system
Gestamp Integrated Laser Cutting/Assembly
Gestamp Integrated Laser Cutting/Assembly
Gestamp Integrated Laser Cutting/Assembly
Gestamp Integrated Laser Cutting & Assembly

- Advantages: Assembly laser cutting cell vs. multiple cabinets
  - Dimensional variation minimized
  - Significant floor space reduction (~70%)
  - Zero direct operators (reduction ~10)
- Adjust features or trims easily & quickly
- No mechanical moving parts other than Robot’s – Improved OEE
- Laser cutting operation synchronized with assembly – Reduces WIP and increases efficiency
- Plant work flow improved - Indirect operators significantly reduced
Gestamp Mason DT Door Ring Line
Gestamp Door Ring Future Innovations

**GesWire - Gestamp LWB**
AlSi coated steels laser blank welding technology without coating removal pre-process

**BKT – Softening by laser**
Controlling final microstructure transformation with optimum strength and ductility for each material grade

**Zn coated material**
Cathodic corrosion protection with no need for ablation in the laser blank welding process

**Next Gen PHS Grades**
1000 & 2000 MPa steels to create lighter and stronger solutions

**Press-Quenched High Elongation Steel**
Kinematics control with soft material, crash energy absorption with crack/failure avoidance
Body Strength – SORB Test

SORB - Small Overlap Rigid Barrier
Body Strength – SORB Test

SORB – Small Overlap Rigid Barrier
Road Test Simulator Video
“In what’s about to become the hottest year ever for new pickup unveilings, the 2019 Ram 1500 hits the road first with a smooth, quiet ride and high-end features no competitor can top.”

“Ram’s opulent interior options, ever-improving ride quality, and revised powertrains can only mean one thing: war.”

“The truck is chock-full of the latest technology, it’s off-road skills have been increased, and it’s work efficiency has been enhanced. Overall we are impressed.

“And unlike past Ram interiors, all of the switches and knobs look like high-quality bits that were made for this specific truck instead of belonging to some overused corporate Lego set.”

“On the San Antonio freeways and the outer-ring highways, the suspension tuning was a standout feature, turning choppy ruts and expansion joints into invisible obstacles.”
Summary

- Improvements in steel technologies have helped make the All-New 2019 Ram 1500 a more capable and lighter truck
  - 225lbs of vehicle weight reduction
    - Increased fuel economy
    - Higher payloads and towing capability
  - 101lbs weight save from the body structure
- Strategic mix of a wide range of commercially available steels
  - Improved comfort, safety and NVH refinement
- A new standard hot stamping line with integrated laser cutting and assembly has been developed for efficient door ring press hardened production
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